

Systematics of *Ascia* (*Ganyra*) (Pieridae) Populations in the Sonoran Desert

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Abstract. A breeding population of *Ascia* (*Ganyra*) (Lepidoptera: Pieridae) in the *josephina* complex is confirmed for Arizona. The larval hostplant is found to be *Atamisquea emarginata* Miers., a plant confined to the Sonoran Desert.

This population, while closely related to *Ascia josephina josepha*, is distinct in maculation, androconial pattern, genitalia, and larval host. Its taxonomic status is discussed. Full species status is given to the insect as *Ascia howarthi* (Dixey).

Introduction

During the course of a study for the National Park Service on arthropods of the Quitobaquito Management Area in Organ Pipe Cactus National Monument (OPCNM), Pima County, Arizona, the author discovered an apparent population of a pierid butterfly in the *Asia josephina* (Godart) complex. The discovery is noteworthy in that records of this species complex are scarce in Arizona, in that the insect appears to be breeding in the area, and in the distinct phenotypes of the population.

The genus *Ascia* is divided into two subgenera, each represented by a single Nearctic species or species complex (Howe, 1975). An additional taxon, *A. sevata* (C. & R. Felder), is recorded in Mexico. The subgenus *Ascia* includes the species *monuste* (Linnaeus) and its subspecies. The subgenus *Ganyra* Billberg includes the species (or species complex) *josephina* (Godart) with its Central and North American subspecies *josepha* (Salvin & Godman), *howarthi* (Dixey), and *kuschei* (Schaus) and it also includes the species *sevata*.

Only *josephina josepha* from *Ganyra* has been cited within the United States (Pyle, 1981, et al.). However, the recent studies at Quitobaquito, OPCNM confirm the presence of an Arizona population of the *josephina* complex and suggest assignment outside the subspecies *josepha*.

This paper examines the dimensions of the Arizona *Ganyra* population and its relationships with other populations in the *josephina* complex. It links the Sonoran Desert *Ganyra* population to a specific larval foodplant and alters the taxonomy of the species complex.

A series of both sexes of adults of Sonoran Desert *Ganyra* was collected from several wild populations. Those were further augmented by specimens from the San Diego Natural History Museum, the California Insect Survey collection, and the private collection of Kilian Roever. A

small series of *A. josephina* from southern, eastern, and western Mexico, as well as Texas, was also obtained. The Texas A & I collection and the private collections of J. Brock, D. Mullins, and P. Hubbell were also used. Steve Prchal of the Arizona-Sonora Desert Museum photographed all stages of the life history. Measurements were done using a Lasso Ocular Filar. An ISI-DS-130 scanning electron microscope at the University of Arizona campus was used for the micrographs.

Taxonomy

Most of the taxa in the *A. josephina* complex were originally described in the genus *Pieris* Schrank. They were later placed in the genus *Ascia* Scopoli and still later in either the genus or subgenus *Ganyra*, depending on the author. Godart described nominate *josephina* in 1819 from the Antilles, probably Haiti and Cuba (Salvin & Godman, 1868). It is characterized by the large size, falcate forewing, and a large black forewing discal cell-spot. Two other closely related Antillean subspecies have been described: *paramaryllis* Comstock from Jamaica, and *krugii* (Dewitz) from Puerto Rico. Both of these are somewhat smaller, with the characteristic black forewing cell-spot narrow (Comstock, 1943).

The subspecies *josepha* (Salvin & Godman) is the widespread Mexican and Central American form. It differs from nominate *josephina* primarily in the shape of the wings. The forewings are not as falcate as those of *josephina* and the hindwings are more squared and less produced at the anal angle. It occurs from southern Texas (straying northward to Kansas) through eastern Mexico into Central America and north along the west coast of Mexico into Sinaloa.

Dixey (1915) described subspecies *howarthi* from Baja California Sur, Mexico. He described it as having more noticeable marginal spotting on the forewing and more pronounced reticulations on the ventral hindwing than typical *josephina*, as well as being comparatively small (males 58 mm wingspread, females 52–54 mm).

Schaus (1920) described *kuschei* from Mazatlan, Sinaloa, Mexico. It is characterized by a greater extent of the submarginal maculation on the forewings in both males and females. He cited both sexes as having wingspreads of 56 mm which is considerably smaller than typical *josephina*.

Felder & Felder (1861) described the taxon *sevata* from Venezuela. Rindge (1948) cited the Baja California population of *Ganyra* as *A. sevata kuschei*, a new combination at that time. The original description of *sevata* mentioned a solid white dorsal surface except for the apical marginal border, wider in females than in males. Fruhstorfer (1908) subsequently named a more northerly subspecies, *A. sevata tiburtia*, from Guatemala. It differs from true *sevata* in the narrowing or absence of *A. sevata*'s 5 mm forewing border. The ventral hindwings of *A. sevata* and *A. tiburtia* are also suffused with shades of violet and pink respectively. No mention of forewing cell-spots is made for either taxon.

There are obvious close superficial relationships among the various members of the subgenus *Ganyra*. A closer look will now be given to the exact relationships between those taxa (north of Guatemala) and where the OPCNM population lies in reference to them.

Several key points suggest that *A. sevata sevata* and *A. s. tiburtia* are more distantly related to the *josephina* complex. The lack of the black forewing cell-spot does not in itself suggest removal from the group since Cuban, Jamaican, and Puerto Rican populations of *josephina* also have this spotting weak to non-existent (Comstock, 1943). However, the presence of a narrow to wide continuous forewing border and pink to purple ventral hindwing coloration do set these taxa apart. More importantly, there are significant differences in the form of the male androconia. These average only 0.24 mm in length in *sevata*, approximately half that of the *josephina* complex members (Dixey, 1915). Hoffman (1976) cited *tiburtia* from southern Mexico, a range overlapping that of *josepha*. This sympatry suggests distinction at the specific level. *Sevata* is here considered outside the *josephina* complex.

The relationship between *A. howarthi* and *A. kuschei* needs clarification. Although *kuschei* was described from Mazatlán, it appears to have been collected far north of there. There are many recent records of a *Ganyra* from the Mazatlán area, all of which represent *josepha*, not *kuschei*. The maculation, androconia, and size are all consistent with *josepha*. The location "Mazatlán" was probably used in a broad sense by Kusche. Phenotypes matching the *kuschei* description occur from extreme northern Sinaloa northward, where he easily may have collected. Many specimens from Sonora and Arizona, and a few from Baja California closely match the *kuschei* description, especially for broods during the summer rains. The type locality for *kuschei* should probably be amended to San Miguel, near Los Mochis, Sinaloa, Mexico, the southernmost locality for which that taxon is known. The *howarthi* phenotype, at least ventrally, is restricted to Baja California. But other phenotypes with unmarked ventral hindwings also occur there. These unmarked phenotypes are also widespread in central and northern Sonora and represent the majority of the specimens taken at OPCNM. The three phenotypes — heavily marked *kuschei*, ventrally marked *howarthi*, and the unmarked population — all blend with each other. Also, the OPCNM population was reared on a Sonoran Desert shrub, *Atamisquea emarginata* Miers., in the family Capparidaceae. When mapped together, the distribution of the three phenotypes duplicates that of the probable hostplant, *A. emarginata* (Fig. 1). *Kuschei* and *howarthi*, plus the unmarked phenotype are therefore considered synonymous. Similarities in size, androconial pattern, and the distribution of the larval foodplant all suggest this. Since *howarthi* has priority, the name *kuschei* is suppressed as a junior synonym.

The third clarification necessary is the relationship between *josepha* and *howarthi*. On the basis of size, *howarthi* and *josepha* represent two

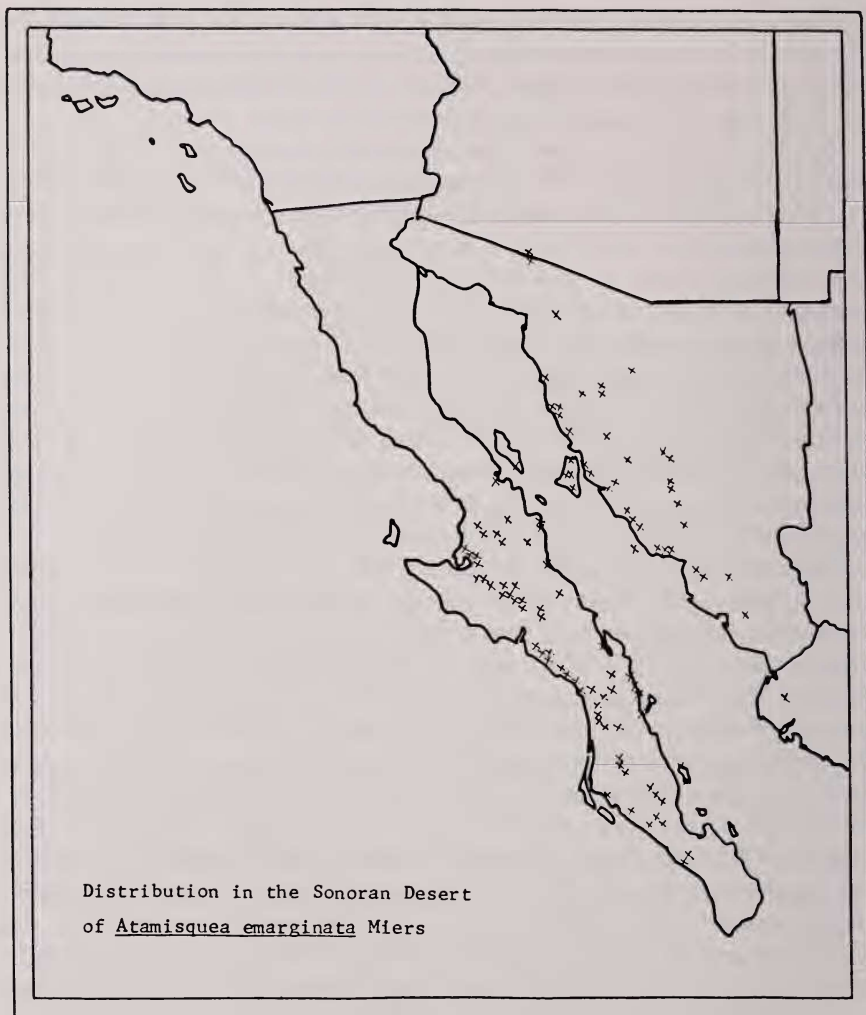


Fig. 1. Distribution of *Atamisquea emarginata*, probable larval host of *Ascia howarthi*.

very different populations. Both sexes of *howarthi* average in excess of 10 mm smaller in forewing length than those of *josepha*. There is no size overlap in the males and only a single small female *josepha* overlaps the size range of female *howarthi*. The size mentioned for *howarthi* by Dixey (1915) seems inflated. He cited the male wingspread as 58 mm but the male figured is only partially spread. His figure has a 55 mm wingspread with a 26 mm forewing length. In contrast, a well-spread specimen with a 26 mm forewing length has only a 45 mm spread.

The wing shape is also different in the two taxa. In *howarthi*, the forewings are somewhat shortened and the hindwings are very rounded. In *josepha*, and apparently even more so in nominate *josephina*, the

forewings are produced or even falcate while the hindwings have the anal angles extended (Figs. 2-5).

In their maculation, the males of *howartha* are generally more heavily patterned than those of *josepha*, especially with forewing marginal and submarginal spotting. Females are very similar in the two taxa, but in *josepha* dark morphs are often produced where the ground color is heavily overlaid with cinnamon brown. All specimens of this morph seen were mid-summer captures and probably parallel the long-day form of *Ascia monuste* (Pease, 1962). The absence of dark morphs in *howartha* is interesting in light of the paucity of records away from breeding colonies (Fig. 6). Both sexes of *howartha* have an additional diagnostic mark on the ventral hindwing. Aside from the dark scaling distal to the crossveins at the base of cells M3 and Cul, there is a darker spot on and around the cross-vein at the base of cell M2. While males of *josepha* will rarely have that cross-vein darkened (even dorsally) it is not scaled away from the vein as in *howartha*.

While the androconial scales of *howartha* and *josepha* are similar in size and configuration (Dixey, 1915), their placement on the wings is vastly different. All androconia of *howartha* are confined to forewing cells M3, Cul, Cu2, and 2A (Fig. 4). On *josepha*, the androconia in these cells are far more extensive. In addition, scent scales are present in cells M2, M1, and the discal cell. Furthermore, *josepha* invariably has androconia on the hindwing as well, in cells RS, M2, M3, the discal cell, and occasionally in Cul.

The general configurations of the male genitalia of both taxa are similar. Due to the larger size of *josepha*, the entire genital capsule is larger in that taxon than in *howartha*. However, the length of the saccus

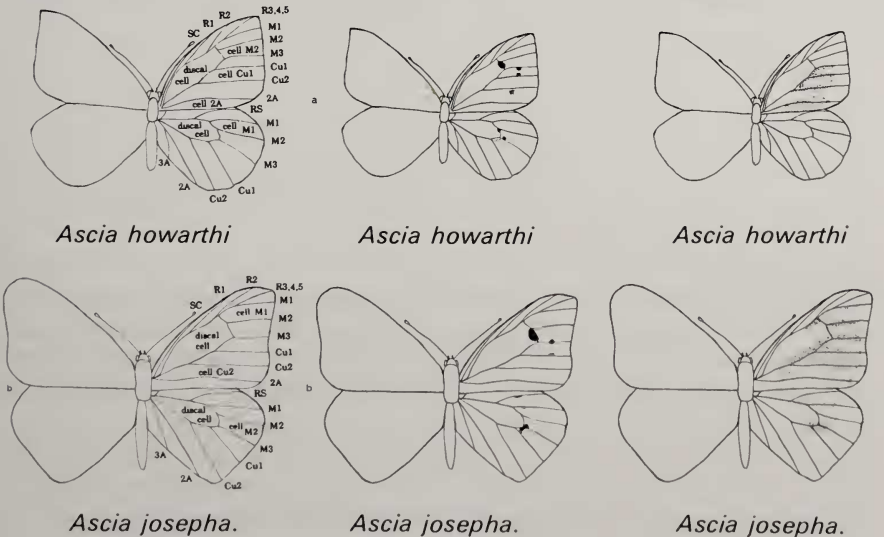


Fig. 2. Venation Fig. 3. Ventral maculation Fig. 4. Androconia pattern

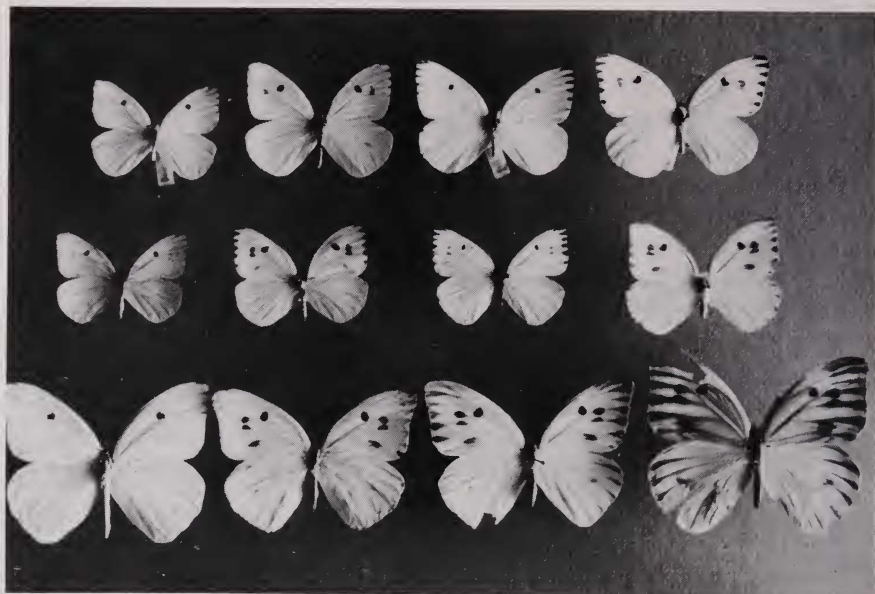


Fig. 5. Phenotypic range of *Ascia howarthi* (top two rows, males above, females below) and *Ascia josephina josepha* (bottom row).

is proportionately greater in *howarthi* than in *josepha*. Likewise, the aedeagal elbow (Fig. 7) of *josepha* is proportionately larger than that of *howarthi*. These genitalic differences are present but best used cautiously.

For the genus *Ascia*, members of the families Cruciferae, Capparidaceae, and Batidaceae have been reported as hostplants (Howe, 1975). More specifically, *Capparis frondosa* Jacq. was cited as a hostplant for *A. josephina josepha* (Jordan, 1981). Although this caper is confined to the eastern slope of Mexico, mostly Tamaulipas and Veracruz (Standley, 1961), other members of the genus have wider distributions in Mexico and probably serve as foodplants in other parts of the range of *josepha*. Members of the genus *Capparis*, whose distributions include Sinaloa, are *C. flexuosa* L., *C. verrucosa* Jacq., and *C. indica* (L.) (Standley, 1961). Any of these might serve as larval hosts for *josepha* since the northern distributional limits of the plant and insect appear to match one another. None of the members of the genus *Capparis* has been reported as far north as Sonora. Records for *josepha* extend north to Mazatlán, Elota, and Guamuchil, approximately 100 km southeast of Los Mochis in northern Sinaloa.

Records of *howarthi* extend south into northern Sinaloa, near Los Mochis. This brings the two taxa within 100 km of each other. In fact, a somewhat questionable record of a dark morph female *josepha* taken near Alamos, Sonora would bring the two populations into overlap. The lack of an apparent cline or anything resembling intergrades suggests a high integrity and differentiation between the two populations.

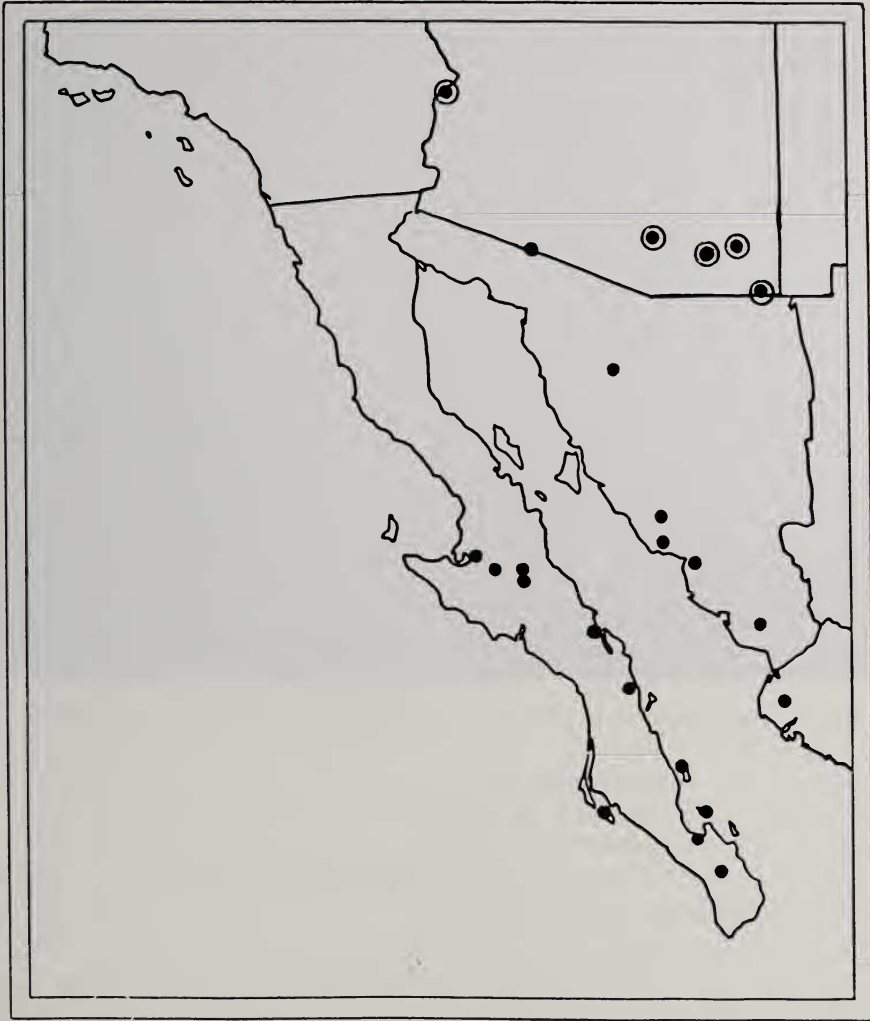


Fig. 6. Distribution of *Ascia howarthi*.

This differentiation between the Sonoran Desert *Atamisquea*-feeding *howarthi* and the *Capparis*-feeding *josepha* of the remainder of Mexico persists even when *howarthi* is compared to *josephina* as a whole. It therefore appears that the differences are at the species level, not at the subspecies level. Therefore, I propose to elevate the taxon *howarthi* to species status. It is most closely related to *A. josephina*, less so to *A. sevata*.

The genus north of Guatemala and exclusive of the Antilles would be composed of four species as follows:

Genus: *Ascia* Scopoli

Subgenus *Ascia* Scopoli



Fig. 7. Aedeagus of *Ascia howarthi* showing "elbow" to left of center.

1. *monuste* (Linnaeus)
 - a) *monuste* (Linnaeus)
 - b) *phileta* (Fabricius)
 - c) *cleomes* (Boisduval & Le Conte)
- Subgenus *Ganyra* Billberg
2. *josephina* (Godart)
 - a) *josepha* (Salvin & Godman)
3. *howarthi* (Dixey)
4. *sevata* (C. & R. Felder)
 - a) *tiburta* (Fruhstorfer)

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